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Letter Report

**FIELD INVESTIGATION
AND SOIL SAMPLING RESULTS
FORMER BUILDING 147,
BUILDING 302, AND BUILDING 127
at
AIR FORCE PLANT 42
Palmdale, California**

Prepared for

**Air Force Center for Environmental Excellence
Brooks AFB, Texas
and
Aeronautical Systems Center
Air Force Plant 42
Palmdale, California**

August 1994

Prepared by

**ENGINEERING-SCIENCE, INC.
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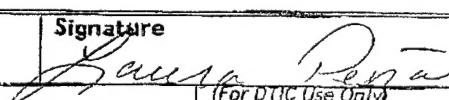
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Letter Report
Field Investigation and Soil Sampling Results
Former Building 147, Building 302, and Building 127
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Palmdale, California

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LETTER REPORT
FIELD INVESTIGATION AND SOIL SAMPLING RESULTS,
FORMER BUILDING 147, BUILDING 302, AND BUILDING 127
at
AIR FORCE PLANT 42
Palmdale, California

1.0 INTRODUCTION

Bioventing pilot tests were planned at Air Force Plant 42 (AFP 42) in Palmdale, Los Angeles County, California at two sites (Former Building 147 and Building 302) with a third site (Building 127) serving as an alternate. Drilling and soil sampling activities were performed at AFP 42 as the first stage of the bioventing pilot tests. However, significant hydrocarbon contamination was not detected at any of the three sites and no pilot tests were performed. No vent wells (VWs), vapor monitoring points (VMPs), or blower units were installed.

The purpose of this letter report is to describe the results of drilling and soil sampling activities. Site histories, previously known contamination distributions and concentrations, and geologic/hydrogeologic profiles are documented in the Draft Bioventing Pilot Test Work Plan. Background information on the development and recent success of the bioventing technology is found in the document entitled "Test Plan and Technical Protocol for a Field Treatability Test for Bioventing" referenced in the Draft Bioventing Pilot Test Work Plan.

2.0 SITE ACTIVITIES

2.1 Borehole Advancement and Abandonment

Twenty boreholes were advanced by hollow-stem augering during the drilling activities performed between 31 May and 3 June 1994. Boreholes were located in areas of previously noted soil contamination. Significant contamination was not observed in any of the borings, and all boreholes were abandoned by grouting to surface. Borehole drilling services were provided by West Hazmat Drilling Corp. of Anaheim, California. Soil sampling was directed at each site by Mr. Tom Blaney of the Engineering-Science, Inc. (ES) office in Pasadena, California.

Continuous soil sampling was performed in three boreholes at Former Building 147, in two boreholes in Building 302, and at one borehole at Building 127. The continuous sampling provided detailed stratigraphic control. All other borings were sampled by split-spoon methods and/or collection of cuttings from auger flights.

2.2 Soil Sample Field Analysis

At all three sites, soils were screened for contamination based on field observations such as visual appearance, odor, and organic vapor analysis (OVA) readings of soil sample headspace as described in the protocol document. OVA readings were monitored in order to estimate the relative amount and extent of soil contamination.

A Gas Tech™ Total Hydrocarbon Vapor Analyzer (THVA) or a photoionization detector (PID) was used to screen field samples by OVA. The THVA is calibrated with hexane and the PID is calibrated with isobutylene; these provide conservative readings representative of total petroleum hydrocarbon vapors present. A 100 ppmv OVA reading of the headspace was the criterion used in determining whether soils were potentially contaminated.

The maximum OVA reading of soil sample headspace was 56.1 ppmv (at Building 302); all other readings were below 10 ppmv. Soil sample locations and detailed OVA readings are discussed in Section 3.0.

2.3 Soil Sample Laboratory Analysis

Soil samples were collected using a split-spoon sampler containing brass tube liners. Soil samples collected in the brass tubes were immediately trimmed and the ends sealed with Teflon™ fabric held in place by plastic caps. Soil samples were labeled following the nomenclature specified in Section 5.5 of the protocol document, wrapped in plastic, and placed in an ice chest for shipment. A completed chain-of-custody record form accompanied the ice chest, which was shipped for analysis to PACE Inc. in Huntington Beach, California.

Two soil samples for laboratory analysis were collected from each site during drilling activities. Soil samples were analyzed for individual fuel types (fuel scan analysis) using EPA Method 8015 (modified); benzene, toluene, ethylbenzene, and xylenes (BTEX); and moisture content.

The results of all laboratory analyses are summarized in Table 1. No contamination was detected in any soil samples.

3.0 SITE-SPECIFIC ACTIVITIES AND RESULTS

3.1 Former Building 147 (Tanks T1-1 and T1-2)

3.1.1 Site Activities

Drilling of seven boreholes was conducted between 31 May and 1 June 1994. Borehole locations are shown on Figure 1. Boreholes were advanced to a maximum depth of 30 feet below ground surface (bgs). All boreholes were grouted to 3 feet bgs then filled to surface with bentonite. Table 2 summarizes pertinent borehole data.

A previously unreported concrete slab was encountered beneath backfill material in five soil borings at approximately 15 feet bgs. These soil borings were not advanced beneath the pad.

TABLE 1
SOIL SAMPLE ANALYTICAL RESULTS
Former Building 147, Building 302 and Building 127
Air Force Plant 42
Palmdale, California

ANALYTE	METHOD	UNITS	SAMPLE LOCATION - DEPTH					
			Former Building 147		Building 302		Building 127	
			SB-5-30	SB-7-30	B-8-35	B-9-35	1A-H-1-45	1A-H-2-45
TPH	8015M	(mg/kg)	<6	<6	<6	<6	<6	<6
Benzene	SW8020	(mg/kg)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Toluene	SW8020	(mg/kg)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Ethylbenzene	SW8020	(mg/kg)	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Xylenes, Total	SW8020	(mg/kg)	<0.0007	<0.0007	<0.0007	<0.0007	<0.0007	<0.0007
Moisture Content	ASTM D2216	(% by wt.)	9.2	10.1	3.0	4.0	3.4	3.6

NOTES:

TPH - Total petroleum hydrocarbons (fuel scan)

mg/kg - milligrams per kilogram

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FIGURE 1

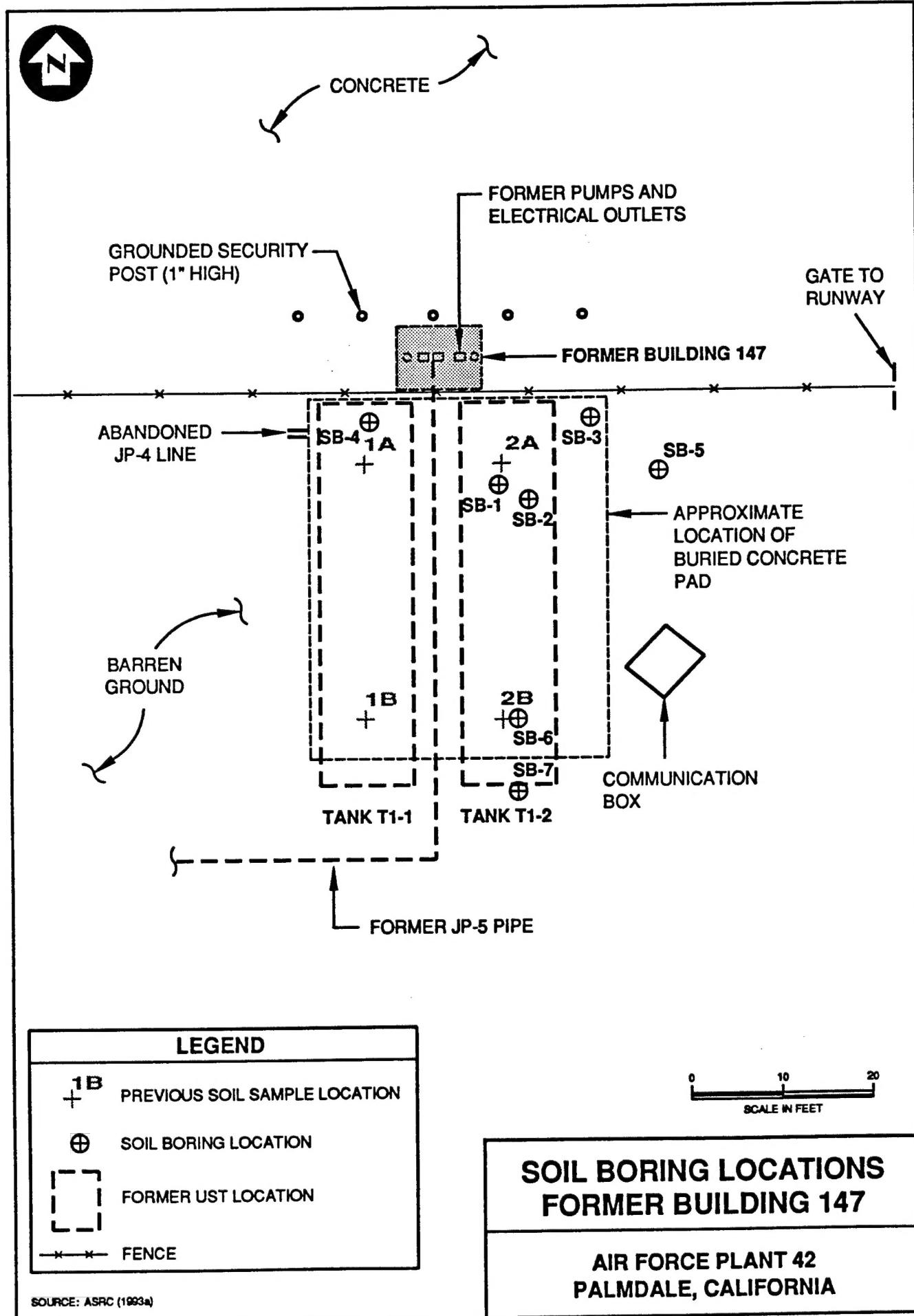


TABLE 2
BOREHOLE AND SOIL SAMPLE SUMMARY DATA
Former Building 147
Air Force Plant 42
Palmdale, California

BOREHOLE ID #	BOREHOLE TOTAL DEPTH (ft. bgs)	SOIL SAMPLE INTERVAL (ft. bgs)	PID HEADSPACE READINGS (ppmv)	SOIL SAMPLE ID #	START DATE	COMPLETION DATE
SB-1	15.5	0-5	0		5/31/94	5/31/94
		5-10	2.2			
		10-15.5	2.8			
SB-2	15.5	0-5	2.2		5/31/94	5/31/94
		5-10	2.8			
		10-14.5	2.8			
		14.5-15.5	NR			
SB-3	15	0-5	NR		5/31/94	5/31/94
		5-10	NR			
		10-15	NR			
SB-4	15	NR	NR		5/31/94	5/31/94
SB-5	30	0-5	2.2		5/31/94	5/31/94
		5-10	0.9			
		10-15	7.0			
		15-20	3.0			
		20-25	3.0			
		25-29	4.0			
		29-30	2.5	SB-5-30		
SB-6	15	0-5	NR		6/1/94	6/1/94
		5-10	1.7			
		10-15	1.7			
SB-7	30	0-5	NR		6/1/94	6/1/94
		5-10	NR			
		10-15	NR			
		15-20	3.5			
		20-25	2.8			
		25-29	3.8			
		29-30	4.0	SB-7-30		

NR - Not Recorded

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3.1.2 Soil Profile

The observed soil profile down to approximately 15 feet bgs in all boreholes except SB-5 is a moderate to dark yellowish-brown sand and gravel fill material. Concrete was encountered beneath the fill material at approximately 15 feet bgs in SB-1, SB-2, SB-3, SB-4 and SB-6. The fill material extended from surface to a depth of approximately 14 feet bgs in SB-7. A moderate yellowish-brown very fine to fine-grained silty sand (native material) was found in SB-5 from surface to a depth of approximately 15 feet bgs.

In SB-5 and SB-7, a moderate yellowish-brown to brown sand extends from approximately 15 to 25 feet bgs. This sand is fine-grain at 15 feet bgs and medium to very coarse-grained at 25 feet bgs. A silty sand was found at the bottom of the soil profile at 30 feet bgs in SB-5 and SB-7.

3.1.3 Subsurface Contamination

None of the boreholes drilled at the site encountered evidence of hydrocarbon contamination. The maximum OVA reading measured was 7.0 ppmv in SB-5 at approximately 15 feet bgs (Table 2). Noticeable fuel odors or discoloration due to contamination were not noted in any of the boreholes.

Samples were collected for laboratory analysis from both SB-5 and SB-7 at a depth of 30 feet bgs. Hydrocarbon contamination was not detected in either of the laboratory samples (Table 1).

3.2 Building 302 (Tanks T3-8 through T3-13)

3.2.1 Site Activities

Drilling of nine boreholes was conducted between 1 and 3 June 1994. Borehole locations are shown on Figure 2. Boreholes were advanced to a maximum depth of 40 feet bgs. All boreholes were grouted to 3 feet bgs, filled to just below surface with bentonite, then covered with black concrete. Table 3 summarizes pertinent borehole data.

3.2.2 Soil Profile

Beneath the surface asphalt, the observed subsurface profile consists of a sand and gravel fill material. This material was noted as backfill; other soil materials encountered during drilling may also have been fill but were not defined as fill because they were similar in characteristics to site soils. The sand and gravel fill extends to a depth of approximately 15 feet bgs in B-1, approximately 30 feet bgs in B-7 and to approximately 5 to 10 feet bgs in all other boreholes. Primarily yellowish-brown clayey to medium-grain sand was encountered in most boreholes beneath the fill material between 5 to 15 feet bgs. A fine to coarse yellowish-brown sand was found from approximately 15 to 20 feet bgs. Clay lenses lie at approximately 24 feet bgs in B-1 and at approximately 15 feet bgs in B-2 and B-5.

Clayey and silty sand was found from approximately 20 to 25 feet bgs and from approximately 30 to 35 feet bgs. Primarily fine to very coarse-grained sand lies between approximately 25 to 30 feet bgs. Very fine to very coarse-grained sand was found at the

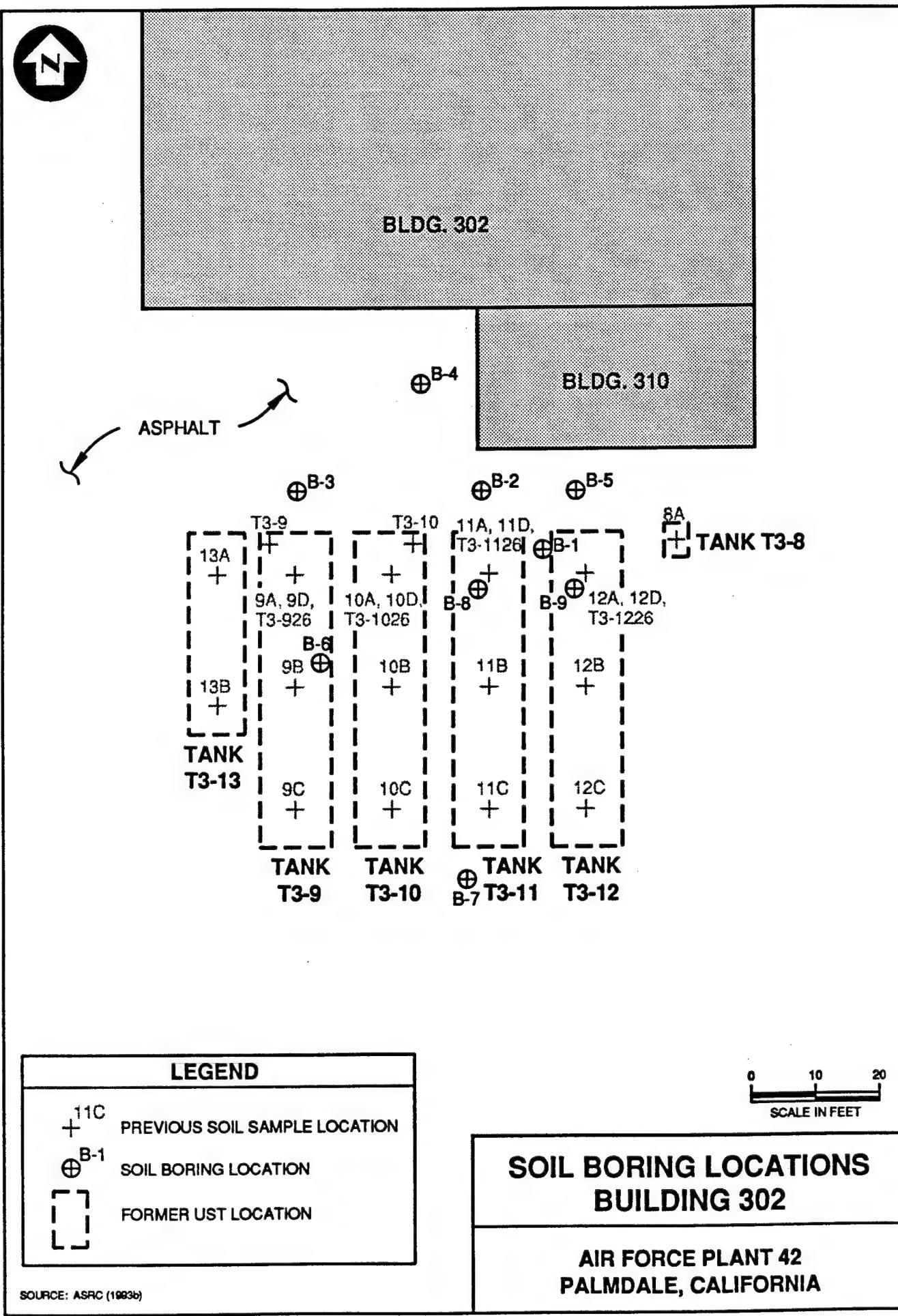


TABLE 3
BOREHOLE AND SOIL SAMPLE SUMMARY DATA
Building 302
Air Force Plant 42
Palmdale, California

BOREHOLE ID #	BOREHOLE TOTAL DEPTH (ft. bgs)	SOIL SAMPLE INTERVAL (ft. bgs)	PID HEADSPACE READINGS (ppmv)	SOIL SAMPLE ID #	START DATE	COMPLETION DATE
B-1	35	0-5	3.1		6/1/94	6/1/94
		5-10	3.0			
		10-15	2.8			
		15-20	3.6			
		20-24	3.6			
		24-24.5	3.0			
		24.5-25	3.4			
		25-30	3.2			
		30-35	4.0			
B-2	35	0-5	7.2		6/1/94	6/1/94
		5-10	56.1			
		10-14.5	NR			
		14.5-15	7.0			
		15-20	5.8			
		20-25	4.2			
		25-26.5	NR			
		26.5-30	4.8			
		30-35	4.4			
B-3	35	0-5	6.8		6/1/94	6/1/94
		5-10	6.0			
		10-15	7.0			
		15-20	2.0			
		20-25	3.7			
		25-30	4.5			
B-4	35	0-5	3.3		6/1/94	6/1/94
		5-5.5	NR			
		5.5-6	3.9			
		6-10	3.8			
		10-15	4.3			
		15-20	4.4			
		20-25	5.1			
		25-30	4.7			
		30-35	4.8			
B-5	40	0-5	NR		6/2/94	6/2/94
		5-10	2.7			
		10-15	2.5			
		15-16	NR			
		16-20	1.6			
		20-25	2.1			
		25-30	4.0			
		30-35	2.7			
		35-39	3.8			

NR - Not Recorded

TABLE 3 (continued)
BOREHOLE AND SOIL SAMPLE SUMMARY DATA
Building 302
Air Force Plant 42
Palmdale, California

BOREHOLE ID #	BOREHOLE TOTAL DEPTH (ft. bgs)	SOIL SAMPLE INTERVAL (ft. bgs)	THVA HEADSPACE READINGS (ppmv)	SOIL SAMPLE ID #	START DATE	COMPLETION DATE
B-6	35	0-5	0		6/2/94	6/2/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-30	0			
		30-35	0			
B-7	35	0-5	0		6/2/94	6/2/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-30	0			
		30-35	0			
B-8	35	0-5	0		6/3/94	6/3/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-25.5	0			
		25.5-30	0			
		30-35	0	B-8-35		
B-9	35	0-5	0		6/3/94	6/3/94
		5-10	0			
		10-15	0			
		15-19.5	0			
		19.5-20	0			
		20-25	0			
		25-30	0			
		30-34	0			
		30-35	0	B-9-35		

NR - Not Recorded

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base of several boreholes. The base of all boreholes, except for B-5, was at 35 feet bgs. The base of B-5 was 40 feet bgs.

3.2.3 Subsurface Contamination

None of the boreholes drilled at the site encountered evidence of significant hydrocarbon contamination. The maximum OVA reading measured was 56.1 ppmv in B-2 at approximately 10 feet bgs. All other OVA readings were below 10 ppmv (Table 3). A slight fuel odor was noted in only one screened sample in B-2 at approximately 5 feet bgs. With the exception of B-2, noticeable fuel odors or discoloration due to contamination were not noted in any of the boreholes.

Samples were collected for laboratory analysis from both B-8 and B-9 at a depth of 35 feet bgs. Hydrocarbon contamination was not detected in either of the laboratory samples (Table 1).

3.3 Building 127 (Tank T1-11)

3.3.1 Site Activities

Drilling of four boreholes was conducted on 2 June 1994. Borehole locations are shown on Figure 3. Boreholes were advanced to a maximum depth of 45 feet bgs. All boreholes were grouted to 3 feet bgs, filled to just below surface with bentonite, then covered with black concrete. Table 4 summarizes pertinent borehole data.

3.3.2 Soil Profile

The asphalt and concrete at the site are underlain by a sand and gravel fill material which was found to a depth of approximately 20 to 25 feet bgs in the first three boreholes. In 1A-H-4, the asphalt is underlain by native material composed of fine to medium-grained yellowish-brown silty sand and fine to coarse-grain sub-angular to sub-rounded yellowish-brown sand. The silty sand is found to a depth of approximately 25 feet bgs.

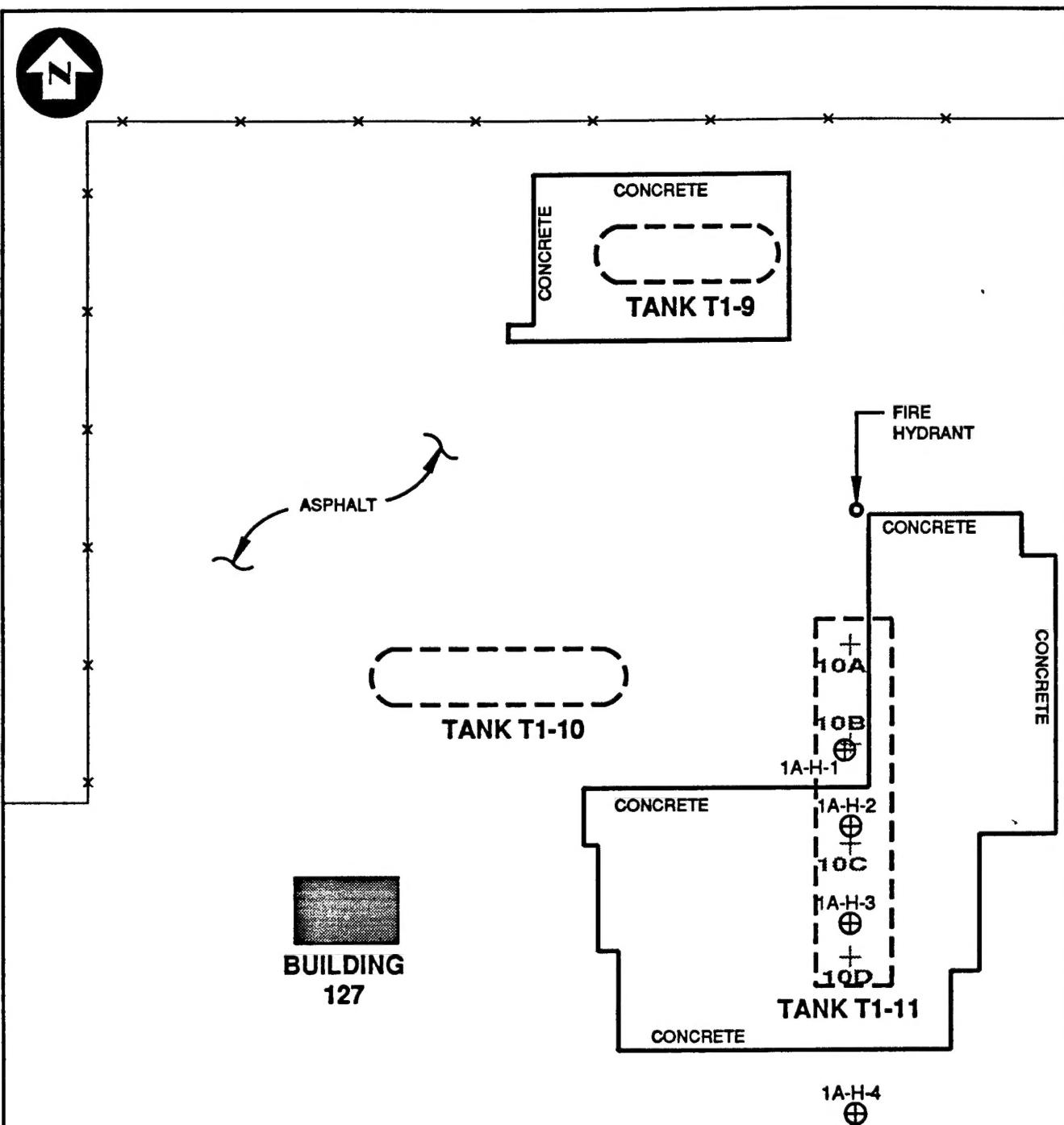
In all boreholes the remainder of the soil profile to the base of the boreholes at 45 feet bgs consist of a heterogeneous predominantly yellowish-brown sand. The sand ranges from sub-rounded to angular and from very fine-grained silty sand to very coarse-grain sand.

3.3.3 Subsurface Contamination

None of the boreholes drilled at the site encountered evidence of hydrocarbon contamination. All OVA readings were 0 ppmv (Table 4). Noticeable fuel odors or discoloration due to contamination were not noted in any of the boreholes.

Samples were collected for laboratory analysis from both 1A-H-1 and 1A-H-2 at a depth of 45 feet bgs. Hydrocarbon contamination was not detected in either of the laboratory samples (Table 1).

FIGURE 3



LEGEND

- 10D + PREVIOUS SOIL SAMPLE LOCATION
- 1A-H-1 ⊕ SOIL BORING LOCATION
- CONCRETE FORMER UST LOCATION
- FORMER UST LOCATION
- X — FENCE

SOURCE: ASRC (1993a)

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**SOIL BORING LOCATIONS
BUILDING 127**

**AIR FORCE PLANT 42
PALMDALE, CALIFORNIA**

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TABLE 4
BOREHOLE AND SOIL SAMPLE SUMMARY DATA
Building 127
Air Force Plant 42
Palmdale, California

BOREHOLE ID #	BOREHOLE TOTAL DEPTH (ft. bgs)	SOIL SAMPLE INTERVAL (ft. bgs)	THVA HEADSPACE READINGS (ppmv)	SOIL SAMPLE ID #	START DATE	COMPLETION DATE
1A-H-1	45	0-1	0		6/3/94	6/3/94
		1-2	0			
		2-5	0			
		5-10	0			
		10-15	0			
		15-20	0			
		20-24.5	0			
		24.5-25	0			
		25-30	0			
		30-32	0			
		32-35	0			
		35-37.5	0			
		37.5-40	0			
		40-45	0	1A-H-1-45		
1A-H-2	45	0-5	0		6/3/94	6/3/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-30	0			
		30-35	0			
		35-40	0			
		40-45	0	1A-H-2-45		
1A-H-3	35	0-5	0		6/3/94	6/3/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-30	0			
		30-33	0			
		33-35	0			
		35-40	0			
		40-45	0			
1A-H-4	35	0-5	0		6/3/94	6/3/94
		5-10	0			
		10-15	0			
		15-20	0			
		20-25	0			
		25-30	0			
		30-35	0			
		35-40	0			
		40-45	0			